

CLAIMS

1. An exercise apparatus, preferably portable and preferably for rehabilitative use by a person in a sitting, reclining or lying position, the apparatus comprising:
 - a housing comprising an interior compartment communicating with the surroundings through one or more apertures, preferably slits in said housing
 - mechanical activation means for being activated by a limb portion of a person, for instance a foot, a hand, a knee or an elbow of said person, said activation means extending from the interior of said compartment to the surroundings through said one or more apertures,
 - first braking or resistance means for exerting a first resistance against a first force applied to said activation means by said limb portion and arranged in said compartment and connected to said activation means, and
 - at least one second braking or resistance means for exerting at least one second resistance against at least one second force applied to said activation means by said limb portion and arranged in said compartment and connected to said activation means.
2. An exercise apparatus according to claim 1 and further comprising:
 - first varying means for varying the magnitude of said first resistance, and
 - second varying means for varying the magnitude of said second resistance.
3. An exercise apparatus according to claim 1 or 2, wherein said first force is a linear force and said second force is a rotative force or torque.
4. An exercise apparatus according to any of the preceding claims, wherein said limb portion is constituted by a foot of said person and said activation means comprise a pedal for receiving said foot with the longitudinal dimension of said foot generally perpendicular to a transverse dimension of said pedal
5. An exercise apparatus according to claim 4, wherein said activation means are adapted for allowing said pedal to move to and fro along a linear path determined by said slit in said housing under the influence of said first force and for allowing said

pedal to rotate to and fro around an axis generally parallel to said transverse dimension under the influence of said second force.

6. An exercise apparatus according to any of the preceding claims, wherein said slits
5 in said housing extend in a generally horizontal direction.

7. An exercise apparatus according to any of the claims 1-5, wherein said slits in said housing extend in a generally vertical direction.

10 8. An exercise apparatus according to any of the claims 4-7, wherein said activation means comprise a first endless drive element in the form of an endless chain, band, ribbon, belt or the like arranged inside said housing and extending around at least two mutually spaced first wheels or pulleys rotatably arranged in said housing, said endless drive element being attached to said pedals such that linear movement of said
15 pedals along said slits causes rotation of said first wheels by means of said first endless drive element.

9. An exercise apparatus according to claim 8, wherein at least one of said first wheels and/or said first endless drive element is connected to first adjustable braking or
20 resistance means adapted and arranged so as to apply a variable braking force to said first wheel and/or said first endless drive element.

10. An exercise apparatus according to any of the claims 5-9, wherein said pedal is pivotably mounted on a shaft located coincidental with said axis and connected to
25 second adjustable resistance or braking means adapted and arranged so as to apply a variable braking force to said shaft.

11. An exercise apparatus according to any of the claims 5-10, wherein said activation means comprise a second endless drive element in the form of an endless chain, band, ribbon, belt or the like arranged inside said housing and extending around at
30 least two mutually spaced second wheels or pulleys rotatably arranged in said housing, said endless drive element being attached to said pedals such that rotational movement of said pedals around said axis causes rotation of said second wheels by means of said second endless drive element.

12. An exercise apparatus according claim 11, wherein at least one of said second wheels and/or said second endless drive element is connected to second adjustable resistance or braking means adapted and arranged so as to apply a variable braking force to said second wheel and/or said second endless drive element.

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13. An exercise apparatus according to claim 11 or 12, wherein at least one first wheel is connected to a corresponding second wheel by means of third adjustable resistance or braking means adapted for braking relative movement between said at least one first wheel and said corresponding second wheel such that movement of
10 said first endless drive element causes a rotational force to be exerted on said corresponding second wheel, the magnitude of said rotational force being determined by the braking effect of said third resistance or braking means.

14. An exercise apparatus according to any of the preceding claims, wherein said
15 resistance or braking means comprise a mechanical friction brake.

15. An exercise apparatus according to any of the preceding claims, wherein said resistance or braking means comprise an electrical motor or a hydraulic motor.

20 16. An exercise apparatus according to claim 15 and further comprising computer controlling means for controlling the power output of said electrical motor or hydraulic motor according to one or more pre-determined sequences or algorithms, and power supplying means for supplying power to said electrical motor or hydraulic motor and said to said computer controlling means.

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17. An exercise apparatus according to claim 15, wherein said mechanical friction brake is arranged for braking the rotation of one of said first or second wheels and comprises a braking body, preferably a disc, having a plane surface and arranged for rotation around the axis of rotation of said wheel, said axis being perpendicular to said
30 surface, and a braking pad or block arranged for being pressed against said surface and for movement between a first position and a second position, the distance of said pad from said axis being larger in said second position than in said first position.

18. An exercise apparatus according to claim 17, wherein a biasing means is provided
35 for biasing said braking pad from said second position to said first position.

19. An exercise apparatus, preferably portable and preferably for use by a person in a sitting, reclining or lying position, the apparatus comprising:

- a housing comprising an interior compartment communicating with the surroundings through one or more apertures,
- mechanical activation means for being activated by a certain portion of said person such as a foot or a hand, said activation means extending from the interior of said compartment to the surroundings through said one or more apertures,
- resistance means for exerting a resistance against a first force applied to said activation means by said person and arranged in said compartment and connected to said activation means,
- first varying means for varying the magnitude of said resistance,
- computer controlling means for controlling said first varying means for varying said resistance according to one or more sequences or algorithms, and
- power supplying means for supplying power to said first varying means and said computer controlling means.

20. An exercise apparatus according to claim 19 and further comprising:

- 20 - force exertion means for exerting a second force on said activation means such that said activation means may transmit said second force to said portion of said person connected to said activation means,
- second varying means for varying the magnitude of said second force, said computer controlling means being adapted for controlling said second varying means for varying said second force according to one or more sequences or algorithms.

21. An exercise apparatus according to claim 19 or 20, wherein the resistance means comprise an electrical generator connected to said activation means such that movement of said activation means rotates said electrical generator.

22. An exercise apparatus according to claim 19 or 20, wherein the resistance means comprise a hydraulic rotary motor or pump connected to said activation means such that movement of said activation means rotates said hydraulic motor or pump.

23. An exercise apparatus according to claim 20 or 21, wherein the force exertion means comprise an electrical motor connected to said activation means such that movement of said activation means results from rotation of said electrical motor.
- 5 24. An exercise apparatus according to claim 20 or 22, wherein the force exertion means comprise a hydraulic rotary motor or pump connected to said activation means such that movement of said activation means results from rotation of said hydraulic motor or pump.
- 10 25. An exercise apparatus according to claim 21, wherein said electrical generator is connected to power uptake means for taking up electrical power generated by said generator.
- 15 26. An exercise apparatus according to claim 25, wherein said power uptake means comprise a variable electrical resistance, said variable electrical resistance being adapted for being varied by said computer controlling means.
- 20 27. An exercise apparatus according to claim 26, wherein cooling means are provided for cooling said electrical resistance.
- 25 28. An exercise apparatus according to any of the claims 25-27, wherein said power uptake means comprise an electrical conduit for connecting said generator to the power mains or an external electrical energy consuming means such as a heater, a battery recharger or the like.
- 30 29. An exercise apparatus according to any of the claims 19-28 and for use for exercising foot and/or leg muscles and joints of said person, wherein said apertures in said housing are constituted by two slits, preferably generally rectilinear, said activation means comprising two connection members each adapted for connecting a foot receiving means or pedal with a mechanism arranged inside said compartment, each of said connection members extending through one of said slits for allowing said pedal to move in a reciprocating, generally linear manner and in a reciprocating rotational manner.
- 35 30. An exercise apparatus according to any of the claims preceding, wherein the housing is provided with a smooth, preferably resilient, surface.

31. An exercise apparatus according to any of the preceding claims, wherein the housing is provided with fastening means for fastening attachment means for attaching the housing to a chair, a table, a bed, a wheel chair or any other means for
5 accommodating a person utilising the apparatus.
32. An exercise apparatus according to any of the preceding claims, wherein the housing is provided with fastening means for fastening supporting means for supporting the housing in a stable position on a horizontal surface such as a floor or a
10 table top.
33. An exercise apparatus according to any of the preceding claims, wherein the housing is provided with gripping means for being gripped by a user of the apparatus for stabilizing the apparatus during use thereof.
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34. A brake mechanism for braking the rotation of a body, preferably for use as a braking or resistance means in an exercise apparatus according to any of the preceding claims, said mechanism comprising
- a first disc and a second disc having mutually facing and spaced first planar surfaces
 - 20 and being mounted on a common shaft perpendicular to said surfaces, the second disc being mounted rotatable and axially displaceable with respect to said shaft,
 - biasing means, preferably tension springs attached to said discs, for biasing said second disc axially towards said first disc and for biasing said second disc from a first rotational position relative to said first disc towards a second rotational position relative
 - 25 to said first disc,
 - pairs of mutually facing and registering annular grooves provided in said first surfaces and extending concentric with said shaft, a groove of a pair in one first surface registering with the other groove of said pair in the other first surface,
 - at least one sphere with a diameter larger than the maximum distance between said
 - 30 first surfaces received in each pair of grooves,
 - the combined depth of the grooves in a pair being larger at one end of the grooves than at the other end of the grooves,
 - a fixedly arranged body having a planar second surface facing and spaced from a third planar surface of said second disc parallel to and opposed to said first surface of
 - 35 said second disc,

- a braking pad or block arranged between said second and said third surface and displaceable between a first position at a certain distance from the axis of said shaft to a second position at a larger distance from said axis, and
 - a biasing means for biasing said braking pad from said second position to said first
- 5 position.

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